

TABLE 3.—Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during November, 1930

Altitude (meters) m.s.l.	Broken Arrow, Okla. (233 meters)		Brownsville, Tex. (12 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (139 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)		Los Angeles, Calif. (145 meters)		Medford, Oreg. (410 meters)		
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	
Surface.	°		°		°		°		°		°		°		°		°		°		°		°		
500.	S 16 W	1.2	N 52 W	0.7	S 4 W	3.0	N 69 W	5.6	N 1 E	1.6	N 44 W	3.4	N 25 E	0.7	°	W	2.0	N 9 W	1.2	N 42 E	3.2	N 49 W	1.7	N 51 W	0.3
1,000.	S 39 W	4.3	N 47 E	3.6	S 22 W	6.9	N 25 E	2.6	N 24 W	2.1	N 46 W	3.8	N 11 W	0.4	N 1 E	1.4	N 59 E	8.4	N 70 E	1.3	N 70 E	1.3	N 86 W	0.3	
1,500.	N 83 W	5.6	N 71 E	2.8	S 63 W	8.9	N 63 W	8.9	N 68 W	3.7	N 33 W	7.5	N 64 W	3.0	S 79 W	5.8	S 62 W	1.4	N 68 E	6.0	N 72 E	1.6	S 39 E	1.6	
2,000.	N 62 W	5.7	N 10 W	2.6	S 63 W	8.4	N 63 W	8.4	N 68 W	3.7	N 37 W	9.3	N 64 W	6.5	N 66 W	8.3	S 89 W	2.9	N 78 E	3.3	N 40 E	1.3	S 23 E	2.6	
2,500.	N 68 W	6.8	N 69 W	1.6	S 86 W	12.7	N 67 W	8.5	N 66 W	6.6	N 59 W	8.0	N 76 W	7.1	N 61 W	9.5	N 81 W	6.2	N 82 E	1.5	S 64 E	1.1	S 30 W	2.3	
3,000.	N 86 W	6.8	N 73 W	2.8	N 78 W	9.2	N 53 W	10.5	N 74 W	10.0	N 63 W	8.4	N 82 W	7.0	N 67 W	11.2	N 78 W	8.4	N 7 E	1.5	N 11 E	2.7	S 51 W	2.6	
4,000.	S 88 W	7.0	N 55 W	0.7	N 64 W	10.7	N 54 W	9.5	N 65 W	11.1	N 77 W	7.4	N 76 W	5.5	N 56 W	13.1	N 78 W	9.3	N 15 W	0.6	N 51 W	5.1	S 58 W	4.0	
5,000.	---	---	N 50 W	2.3	---	---	N 66 W	8.2	N 65 W	8.0	N 70 W	7.4	N 70 W	6.3	---	---	N 77 W	11.7	N 40 W	2.4	---	---	S 81 W	6.0	

Altitude (meters) m.s.l.	Memphis, Tenn. (145 meters)		Modena, Utah (1,665 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (321 meters)		Phoenix, Ariz. (356 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,294 meters)		San Francisco, Calif. (8 meters)		Sault Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Spokane, Wash. (606 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface.	°		°		°		°		°		°		°		°		°		°		°		°	
500.	S 49 W	1.1	S 84 W	1.6	N 5 E	1.3	S 9 E	1.2	N 81 E	3.4	S 27 W	1.9	S 46 E	1.7	N 9 E	1.0	S 6 W	0.5	S 52 E	0.4	S 47 E	0.7	N 81 W	0.4
1,000.	S 87 W	3.9	---	---	N 11 E	3.9	S 35 W	4.6	N 74 E	4.1	S 61 W	6.7	S 61 W	6.7	N 9 E	3.0	S 67 W	2.0	S 13 W	1.8	---	---	N 88 W	4.0
1,500.	S 79 W	6.0	---	---	N 31 W	2.6	S 78 W	7.7	S 68 E	3.6	S 74 W	7.1	S 74 W	7.1	N 10 E	3.6	N 73 W	4.8	S 26 W	6.9	S 13 E	2.7	N 88 W	7.1
2,000.	S 83 W	5.2	---	---	N 26 W	7.0	S 86 W	6.9	S 62 E	3.1	S 74 W	7.3	S 63 E	0.9	N 12 E	2.3	S 84 W	8.3	S 40 W	6.3	S 33 W	5.1	N 69 W	8.5
2,500.	N 83 W	5.2	N 36 E	2.2	N 36 W	7.0	N 87 W	6.9	S 49 E	1.1	S 71 W	9.5	N 15 E	0.6	N 13 E	2.4	S 79 W	9.7	---	---	S 57 W	7.2	N 83 W	6.6
3,000.	N 39 E	4.3	N 39 E	4.3	N 18 W	5.4	N 88 W	10.4	S 66 E	1.3	N 83 W	8.0	N 23 W	1.5	N 25 E	5.2	---	---	---	---	S 67 W	9.8	N 75 W	6.4
4,000.	N 51 W	7.3	N 36 E	3.4	N 21 W	5.2	N 89 W	7.8	N 58 E	0.9	---	---	N 37 W	3.3	N 20 E	5.4	---	---	---	---	S 72 W	10.2	---	---
5,000.	---	---	N 14 E	4.5	---	---	N 44 W	9.0	N 28 E	2.8	---	---	N 34 W	4.1	---	---	---	---	---	---	---	---	---	---
	---	---	N 15 E	5.1	---	---	---	---	---	---	---	---	N 75 W	2.9	---	---	---	---	---	---	---	---	---	---

TABLE 4.—Observations by means of kites, captive and limited height sounding balloons during November, 1930

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center Ind.
Mean altitudes (meters) m. s. l. reached during month	2,614	2,285	3,233	2,309	2,828
Maximum altitudes (meters) m. s. l. reached and date	4,406	4,274	5,549	4,070	4,345
Number of flights made	28	29	27	17	26
Number of days on which flights were made	28	28	22	17	26

In addition to the above there were 163 scheduled pilot balloon observations made daily at 56 Weather Bureau stations in the United States.

## WEATHER IN THE UNITED STATES

### THE WEATHER ELEMENTS

By M. C. BENNETT

#### GENERAL SUMMARY

The first decade of November was warm for the season throughout much of the western section of the country, but it was generally cool in the Central and Eastern States. Thereafter, unusually high temperatures prevailed generally in the East until near the end of the month, when they were abnormally low, with freezing weather as far south as northern Florida. As a whole, the month averaged warmer than normal from the northern and central Great Plains eastward to the Atlantic Ocean, but in the South, the more eastern States, and the Ohio Valley, it was near the normal. Decidedly cold weather for the season prevailed in much of the far Northwest, especially in the northern and central Great Basin, while it was decidedly above normal in the south Pacific area.

For the month as a whole, precipitation substantially above normal was received over an area from southwest Virginia southwesterly to the Gulf, with some portions of the southern sections receiving from two to four times the normal amount. Heavy falls were received also in

the central and northern Great Plains, the central Rocky Mountains, the Great Basin, and southern California. On the other hand, much of the far Northwest, the northern Rocky Mountain districts, and parts of the Ohio Valley and the Middle Atlantic States received less than half the average for November. Light snow fell as far south as Georgia, and some heavy falls were received in the upper Lake region and much of the Northwest.

#### TEMPERATURE

The very first days were abnormally cool practically everywhere east of the Rocky Mountain divide, and the first 10 days of November, as a whole, were cooler than normal in the eastern half of the country, especially in the lower Mississippi Valley and to the eastward, but were mild in the West.

The middle decade of the month and the first half of the final decade were comparatively warm east of the Rocky Mountains, particularly in the Lake region and the upper Mississippi Valley, but were cool west of the Rockies, save on the California coast. The final half of the last decade was cold from the Plains region eastward and in most of the Plateau region; but was milder than normal in the northern Rocky Mountain States, near the Mexican border, and near the Pacific coast.

The month of November showed great contrast in the prevailing temperature conditions in different parts of the country, as is to be expected during the colder portion of the year. Part of the upper Mississippi Valley averaged about 5° warmer than normal, while some districts in the middle and northern Plateau averaged 6° colder than normal. Almost all of the Rocky Mountain region and the country to the westward, and practically all parts of the Gulf and South Atlantic States averaged cooler than normal. Most middle and northern areas east of the Rockies showed positive departures, which were considerable in a strip from North Dakota to New York. Also much of the Pacific coast area and a large part of interior California averaged warmer than normal.

The highest temperatures were usually recorded very early in the month in the far Southwest, but on various dates in the far Northwest, and on or about the 10th in some north-central districts. In nearly all States from the Plains eastward to the Atlantic coast they occurred during the period from the 14th to the 22d, and the highest readings on the 18th or 19th in much of the Mississippi and lower Ohio Valleys and the upper Lake region were among the highest temperatures ever recorded in those districts during November.

The lowest temperatures in the eastern half of the country were almost invariably noted during the final four days, and in many areas they were nearly or quite the lowest November marks of record. The western half showed less uniformity in time of occurrence, but in a considerable number of States the lowest readings occurred in the period from the 18th to the 22d, or just when unusual warmth for November prevailed in most of the eastern half.

#### PRECIPITATION

Not much precipitation occurred during the first decade, save in scattered areas of limited extent. About the middle of the month heavy rain fell in most of the Southeastern States, and considerable near the coast from New Jersey to southwestern Maine, while much of the far West had important precipitation. The more noteworthy precipitation afterward, till the end of November, occurred in the middle and northern Plains, the Mississippi Valley, near the east Gulf coast, and in portions of the Lake region and the far Southwest.

As a whole, the November precipitation was very unevenly distributed over the country, yet the majority of the States received more than normal quantities. In particular, nearly all of the Southeast had a marked excess, notably Alabama and the western parts of Florida and Georgia. Very different was the situation in dis-

tricts to northward. In northern New England, interior New York, Pennsylvania, and thence southward to northern Virginia, southwestward to the central valleys, and northwestward to central Wisconsin, there was a marked shortage. This month is found to be the ninth to twelfth month in succession drier than normal in Maryland, northern and eastern Virginia, West Virginia, Kentucky, and Ohio, and at least the fifth for most parts of the Lake region.

Northwestern Texas and the adjacent portion of Oklahoma mainly had less precipitation than normal, also much of the northern Rocky Mountain region, northern Idaho, Washington, Oregon, and northwestern California.

In addition to the Southeast, already mentioned, there was more precipitation than normal in much of the upper Mississippi Valley, especially that portion west of the river, in practically all the middle and northern plains, in the Rio Grande Valley and most of the middle and southern plateau, and in much of central and southern California.

#### SNOWFALL

Considerable snow fell in many north-central and northwestern districts, particularly central and southern Idaho, northern Nevada, and most of Utah, Colorado, and northern New Mexico. Most of this occurred about the middle of the month, falling within a few days, with a decided interruption of traffic and some loss of livestock.

Large portions of Montana and the Dakotas likewise had much snowfall. In the Lake region, most of upper Michigan and several western counties of the lower peninsula had much snowfall, and there was considerable during the final week of November in northeastern Ohio and parts of the central Appalachian region, while enough to measure was noted as far south as the elevated portion of northern Georgia. Moderate amounts of snow fell in most of the Northeast.

#### SUNSHINE AND RELATIVE HUMIDITY

Much cloudy weather prevailed in the East, the Gulf States, the Lake region, the far Northwest and the North Pacific States. Elsewhere rather a large amount of sunshine prevailed, especially in the great central valleys, the central and southern Rocky Mountain region, and westward to the Pacific, a number of locations receiving from 15 to 20 per cent or more above the normal. The relative humidity was above the normal in much of the East, the northern Rocky Mountain and plateau regions, while throughout the Great Plains, the central and southern Pacific regions it was, as a rule, below the normal. However, the departures from the normal were nowhere large.

#### SEVERE LOCAL STORMS, NOVEMBER, 1930

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Norfolk, Va.....	4					High tides and wind.	Low areas flooded; beaches badly washed; traffic interrupted; considerable minor damage by wind.	Official, U. S. Weather Bureau.
Florida (east coast).....	7-11			6		High seas and wind.	Schooner sunk; tug beached; steamed disabled; another vessel foundered.	Do.
Foreman, Ark. (4 miles southeast).	15	12:30 p. m.	67		\$600	Tornado.....	Details of damage not reported; path 5 miles....	Do.
Addicks, Tex. (near).....	15	12:45 p. m.	16	1	250	do.....	2 farm houses damaged; 3 persons injured; path 9 miles long.	Do.
Winnsboro, La. (near).....	15	4:30 p. m.	400	1	21,000	do.....	Dwellings and barns destroyed; some timber blown down; several persons injured; path 4 miles.	Do.
Hemphill to Ball, La.....	15	5:15-5:30 p. m.	150-200	5		do.....	Farm buildings wrecked; path 28 miles long....	Do.
Iola, Kans. (4 miles west) ..	15	5:30 p. m.				do.....	Small buildings and telephone poles blown down.	Do.